

# Plans Preparation Manual (U.S. Customary Units)

## Chapter 3 – Preliminary Project Development Drawings

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### CHAPTER 3

### PRELIMINARY PROJECT DEVELOPMENT DRAWINGS

#### 3-1 INTRODUCTION

##### 3-1.1 General

This chapter deals with various drawings, which are prepared during the development of a project. Each drawing has a specific use, which dictates what needs to be shown on the map. The uses and minimum contents are described and illustrated by examples.

Frequently, the same basic drawing can be used to meet the needs of several specific drawings by the addition of appropriate notes, titles, and a minimum of delineation. Content along these lines are included in the discussion of the various preliminary project development maps which follow.

##### 3-1.2 Maps

A map is a graphic representation of the existing features of the earth's surface. These features consist of essentially two things - relief and planimetry.

Relief is normally shown by contours, breaklines and spot elevations. A map showing only relief is a "Digital Terrain Model" (DTM).

Planimetry is a representation of man-made culture and natural features. A map showing only planimetric features (not relief) is a "planimetry map." A map depicting both relief and planimetry is a "topographic map."

A map showing primarily the extent of property ownership, areas, definition of boundaries, and corners is a "cadastral map." At the California Department of Transportation (Caltrans) such maps are commonly referred to as right of way maps.

Maps serve as means of locating, recording, and referring to planimetric, DTM or topographic features. They are utilized for studies, planning and designing improvements or replacements to existing facilities.

##### 3-1.3 Photogrammetric Maps

On all projects, consideration should be given to maps produced by photogrammetric methods.

At Caltrans these maps are used for design and planning.

TABLE 3-1		
PURPOSE	SCALE	CONTOUR INTERVAL
Design	1"=50"	2 ft
	1"=100"	5 ft
Planning	1"=200'	10 ft

Photogrammetric map scales and contour intervals vary widely. Table 3-1 indicates the most commonly used scales and contour intervals on maps.

Photogrammetric map content may differ as indicated in Section 3-1.2. Features, such as cultural (man-made), DTM (contours and elevation information), hydrographic (water), vegetation (trees, brush orchards, etc.), etc., may be omitted or added depending on the particular map requirements.

Photogrammetric maps may be utilized for reports, working drawings, project plans, etc. For further information concerning the use of photogrammetric maps contact the District Photogrammetry Coordinator or the headquarters Office of Geometronics.



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Caltrans Standard Plan A10E contains the standard symbols used for topographic mapping by photogrammetric methods. Standard Plan A10C contains standard symbols used for contract plan design. Symbols for topographic mapping and contract plan design are contained in the Caltrans MicroStation cell library (ctcellib.cel) and the MicroStation line style resource file (ctlstyle-ss3.rsc).

### 3-2 MAPS AND EXHIBITS - SPECIFIC DATA

#### 3-2.1 General

Preliminary project development drawings are typically developed for a plot scale of 1"=200'. They are used extensively to show the relationship of a project to the surrounding road and street system and to study various alternate geometric designs for a project.

There are numerous sources of mapping for use in preparing project development drawings. Frequently, the same base map can be used to develop several of the drawings described in this chapter. This requires careful selection of the base map.

The Office of Highway System Information and Performance personnel maintain the California Road System mapping. Duplicates of these maps can be used as base mapping for several of the drawings discussed in this Section.

#### 3-2.2 Strip Map

This is one of the most important maps for feasibility studies and for initial development of a project. It graphically shows the basic highway alignment and interchange locations. Map scales should be kept in the 1"=200' to 1"=600' range. The date of preparation and

subsequent revisions must be shown. Special original drawings are not required. The following data is required:

##### *(1) Plan*

The map shall show the freeway lanes, crossroads, separation structures, interchanges including the complete interchange pattern and frontage roads. The local road pattern and prominent geographical features shall also be shown. Sufficient local street names at the interchanges and adjacent to the freeway should be shown to orient the drawings. A north arrow shall be provided, and shall generally be oriented to point to the right or up.

##### *(2) Profiles*

The freeway profile with its ground line shall be included. If the separate roadways have independent profiles, which are substantially different, both shall be shown. Profiles of ramps, crossroads, and frontage roads are not required.

##### *(3) Typical Section*

Include a schematic freeway geometric typical section (no ramps or frontage roads). The typical section shall show the number of lanes, median and shoulder widths.

##### *(4) Traffic*

All traffic movements for the design year with the AM and PM peaks and ADT shall be shown similar to the Design Designation on the Typical Cross Section plan sheets and by means of traffic diagrams. Indicate the design year or year of traffic count.

#### 3-2.3 Route Adoption Map

The purpose of the Route Adoption map is to document the location and designation of a highway route that has been approved by the California Transportation Commission (CTC).



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A more in depth discussion of the policies and standards regarding Route Adoptions can be found in [Chapter 23](#) of the Project Development Procedures Manual (PDPM).

The following route adoption map formats are used in the selection or designation of highway routes by the CTC:

- (a) freeway or a controlled access highway
- (b) conventional highway
- (c) transfer of highway location
- (d) route re-designation

#### **(1) Format**

- (a) The form for the title and certificate for the various examples are shown in Figures 3-2.3A through 3-2.3E at the end of this chapter.

All type of Route Adoption maps, except for re-designations, must show the Caltrans District delegated Design Official Engineer's certification and signature at the top right corner of the map. The CTC Executive Director's certification and signature must be shown at the bottom left corner of the map.

For freeway adoptions, the phrase "A FREEWAY" is added to the title block, and the wording "and declared a freeway" is added to the CTC Executive Director's certification. For controlled access highway adoptions, the phrase "A CONTROLLED ACCESS HIGHWAY" is added to the title block, and the phrase "and declared a controlled access highway" is added to the certification.

For conventional highway adoptions no special designation needs to be added to the title block or the certification.

Adoption maps of traversable highways are shown with the appropriate designation as discussed above.

A transfer of highway location occurs when a local agency requests that an existing conventional state highway be moved to a parallel local street or road. The title block for these maps will include "Transfer of Highway Location." The map must clearly show the new route to be adopted and the portion of the existing route being superseded and to be relinquished to the local agency.

A route re-designation occurs when there is a need to change the existing route number to a different one. A route re-designation map does not require either a certification or a signature block. The title will reflect the route to be re-designated.

- (b) The original map shall be plotted on 11" tall paper and the length will vary as needed to clearly show all the pertinent information. The minimum length for a plotted map is 17" and the maximum is 42". Other lengths for a plotted map are 24", 30" and 36". The preferred scale for route adoption maps is 1"=1500'. The scale used may vary as long as details are legible and clear. When the map is folded, the title block must be visible. General text sizes are found in the CADD Users Manual. Templates for several size examples with default text sizes (in DGN format) are available on the intranet at:

<http://design.onramp.dot.ca.gov/route-matters-and-freeway-agreements>

Preparation of the base map shall follow standard mapping practice, showing the usual geographical features, for example: rivers, lakes, railroads, streets, and roads. The major arterials in the



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corridor and all streets in proximity to the proposed route are to be shown in urban areas. In rural areas all existing public roads or streets are to be shown. Private roads are not to be shown in either case.

A roadway can be a “public road or public street” even though it is not an official “county road” or “city street.” One of the factors to be considered in determining if a roadway is a public road or public street is whether it is being maintained at public expense. Another factor is whether it is open for public use regardless of who pays for maintenance. It is not necessary that the roadway be paved to be considered a public road or public street. Another factor that can be applied is whether the roadway serves more than one of the ownership’s not adjacent to the adopted route. District files should clearly document the facts upon which the determination is based.

- (c) Existing divided freeways, and expressways with two or more lanes are shown by two parallel lines. Freeway to freeway interchanges are always shown. Other freeway interchange geometrics are not drawn unless an existing facility is shown for clarity.
- (d) An existing state highway is shown by two parallel lines and further identified by the phrase, “Existing State Highway.” Local streets or county roads are shown using two parallel lines. If needed, depending on the scale of the map, local streets and county roads could be shown using single lines, but avoid if possible.
- (e) The route adoption limits in the title block should refer to delineated features, for example: streets, roads, and rivers. Reference to either unincorporated towns or communities by name only or to incorporated city limit lines subject to

change should be avoided. When either end of the route adoption limits is identical to a previous adoption, the description at such coincidental points should be identical when possible.

- (f) When the adoption covers many miles, consideration should be given to using two or more maps with a match line.
- (g) The map drafting style to be used for all route adoption maps include:
  - A heavy solid line showing the location of the proposed state highway and identified by the phrase “Location of State Highway.”
  - The designation of the termini for the location of the highway as “Beginning of Adoption” and “End of Adoption.”
  - The identification of the present State highway shown by parallel open lines, as “existing State highway.”
  - A solid dashed line showing the location of an adopted, unconstructed freeway and labeled with the date of the freeway adoption.
  - An open dashed line showing the proposed location for another state highway concurrently being considered for adoption.
  - Superseded highway to be relinquished needs to be labeled as such.
  - A Legend may be added if needed for clarity.
- (h) Examples at the end of this chapter include additional instructional notes for drafting standards.

### ***(2) Location Map and Vicinity Map***

Location maps are needed for the request for approval of a Route Adoption alignment



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location report to the CTC. If additional details need to be shown to describe the proposed route adoption location, a Vicinity map should also be prepared and included in the report.

A Location map is an 8 1/2" x 11" map with two drawings, one is an area map of the proposed project showing the district, county or city limit lines, all state highways and major local roads when pertinent. The second drawing is a California County map showing the county where the project is located. The California map should always be at the bottom of the Location map.

The location of the requested route alignment should be in the central portion of the map with a text box "ROUTE TO BE ADOPTED" pointing to the route. On the California County map, the label "Location" shall be in bold lettering added with a large arrow (named "locarr" in the MicroStation cell library) pointing to the county where the project is located.

For examples of the "Location map", see Figures 3-2.3F and 3-2.3G at the end of this chapter.

Vicinity maps are similar to Location maps but show a closer look of the proposed route location. See Figure 3-2.3H at the end of this chapter.

#### **(3) Processing**

The Route Adoption Map, the Location Map and the Vicinity Map, if any (as a DGN or PDF file) are to be submitted to the Headquarters Division of Design for the CTC Report.

### **3-2.4 Freeway/Controlled Access Highway Agreement Exhibit**

#### **(1) General**

The purpose of the freeway agreement or a controlled access highway agreement is to document the agreement between Caltrans and a local agency on how and where local streets and roads will be connected to the controlled access facility. Exhibit A shows the location of interchanges, separations, road closures, frontage roads, local streets, pedestrian crossing structures and non-motorized facilities (within the right of way). A more in depth discussion of the policies and standards regarding freeway agreements or controlled access highway agreements can be found in [Chapter 24](#) of the PDPM.

#### **(2) Format**

The freeway agreement and controlled access highway agreement exhibits are to be 11" tall by a length which varies depending on the limits of the agreement and the scale of the map. The scale of the map can vary from approximately 1"=100' to 1"=1000' (with a plotted map length of 11"x17", 11"x30" or 11"x42"). The length of the exhibit shall be sufficient to show at least one adjacent interchange or intersection on each side of the limits of the agreement or preferably should extend to the limits of the city or county, if practical. If a longer Exhibit map is needed, additional sheets should be used with labels like "Sheet 1 of 3", "Sheet 2 of 3", etc. added below the "Exhibit A" callout at the right, top corner of the map. The title block is to be visible when the exhibit is folded to 8 1/2" x 11" dimensions for filing purposes.

There are two types of freeway or controlled access highway agreement exhibits, geometric or symbolic. The symbolic type is always preferred unless the local agency objects to the



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use of a symbolic exhibit before executing the freeway or controlled access highway agreement.

For more information on the preparation of these types of agreement exhibits see [Appendix CC](#) of the PDPM.

The ability to clearly read information contained on the map should be the determining factor when selecting the appropriate scale and number of sheets used for the exhibits. The preferred scale for a Freeway Agreement or Controlled Access Highway Exhibit is 1"=1000'. The scale used may vary as long as details are legible and clear. A graphic Bar Scale shall be used on all exhibits as they may be in effect for a long period of time. By including a graphic scale this document can be reduced or enlarged without the loss of dimensional information. Traffic data, cross sections and profiles are not shown on the agreement exhibits. General text sizes are found in the CADD Users Manual and templates (in DGN format) for preliminary maps with default text sizes are available at:

<http://design.onramp.dot.ca.gov/route-matters-and-freeway-agreements>

For an example of a geometric Freeway Agreement exhibit see Figure 3-2.4A at the end of this chapter. For examples of symbolic type exhibits, see Figures 3-2.4B through 3-2.4F at the end of this chapter.

#### 3-2.5 New Public Road Connection Location Map

##### *(1) General*

A new public road connection (NPRC) request to the CTC is needed to ensure complete evaluation of all proposed revisions to access control so that current and future traffic safety and operations are not compromised. NPRC

approvals are also required to protect the investment in any improvements made to the controlled access highway, and to permit the ultimate development of a full freeway or an expressway when traffic and other conditions require. A DGN file or a PDF of the Location map file will need to be submitted to the Headquarters Division of Design for the CTC Report.

A more in depth discussion of the policies and standards regarding new public road connections can be found in [Chapter 27](#) of the PDPM.

##### *(2) NPRC Location Map*

A NPRC Location map is a 8 ½" x 11" map, with two drawings, one is an area map of the proposed NPRC showing all state highways and major local roads nearby when pertinent. The second drawing is a California County map showing the county where the project is located. This California map should always be at the bottom of the Location map.

The location of the requested route alignment should be in the central portion of the map with a text box "LOCATION OF REQUESTED CONNECTION" pointing to it. On the California County map, the label "Location" shall be in bold lettering added with a large arrow (named "locarr" in the MicroStation cell library) pointing to the county where the NPRC is located.

For examples of New Public Road Connection Location maps, see Figure 3-2.5A & 3-2.5B at the end of this chapter.



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#### 3-2.6 PUC Exhibits

not process the application without the approved environmental document.

##### *(1) General*

The Public Utilities Commission (PUC) requires certain exhibits whenever new railroad grade crossings are proposed, or an existing grade crossing is to be reconstructed, altered or abandoned. These exhibits are prepared in the district and forwarded to the Headquarters Division of Right of Way and Land Surveys, Railroads and Utility Relocation Office for review and assistance with the preparation of an application to the PUC for authorization of proposed work. These exhibits shall clearly show the location and the work affecting the railroad.

**Pertinent dimensions within railroad right of way must be shown in English units. Pertinent dimensions include but are not limited to right of way widths, horizontal and vertical clearances, rail elevations and track layout dimensioning.**

The exhibits for a formal PUC application consist of the following:

- Exhibit A - Two drawings, one which contains a location map and a vicinity map, the other drawing contains a strip map of the proposed project.
- Exhibit B - Drawing which shows the plan, topography, profiles and typical sections of the proposed improvements. If more than one crossing is involved, one Exhibit A will suffice, but a separate Exhibit B must be prepared for each crossing.
- Exhibit C - Narrative of the legal description of the easements required for the subject crossing.
- Exhibit D – Copy of the approved project environmental document. The PUC will

For existing crossings, a short form application under PUC General Order No. 88B may be used in lieu of a formal application.

Each railroad has specific requirements therefore District Railroad Coordination, in conjunction with Headquarters Division of Right of Way and Land Surveys, Railroads and Utility Relocation Office, will ensure that these requirements are met before the application is submitted. The initial submittal package must include the application form, Structure General Plan (if there is a structure involved), Location and Vicinity Maps, plans and profiles of work within railroad property, legal description of any required easements (only for the formal PUC application) and evidence of an approved environment document, such as its cover sheet identifying the project and its signed signature sheet showing approval.

Once the engineering plans have been approved by the Railroad, District Right of Way Coordinator submits the drawings of the required easement and legal description to the Railroad. It should be noted that all documents to the Railroad are to be submitted to the Headquarters Division of Right of Way Office and Land surveys, Railroads and Utility Relocations Office for review and concurrence prior to submitting to the Railroad.

Exhibits A and B should be plotted 11" x 17" but a 22" x 36" plot is acceptable when conditions will not conveniently fit on a 11" x 17" plot. A hardcopy is to be submitted to the Railroad.



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### (2) *Exhibit A*

The first drawing of Exhibit A shall contain the following two maps:

- (a) Location Map - The location map is a small-scale state map showing the county in which the crossing is located. The county lines are to be outlined with dark lines where the county in which the crossing is located. A location arrow shall be pointed to the appropriate county. The location map is to be shown on the left side of the 11" x 17" sheet.
- (b) Vicinity Map - This map is a small-scale map showing the crossing in relation to nearby towns, city, other political subdivisions, and major cultural features. Usually a letter size map of the county showing towns, major land lines, such as township, rancho lines, etc. and major highways will suffice. The crossing location is to be shown by means of a location arrow. The vicinity map is to be shown on the right side of the 11" x 17" sheet.

The second drawing of Exhibit A shall contain the following:

**Strip Map** - This map is basically a portion of the project map or title sheet. The bar scale is usually between 1" = 1000' or 1" = 2000' and the map should cover an area within a radius of 0.6 to 1.2 miles from the crossing. The strip map shows the relationship of the crossing to existing roads, railroads, and additional crossings. The PUC and the United States Department of Transportation crossing numbers must be labeled and shown for each crossing within the project limits.

For all new crossings, the strip map shall show the present state highway route now being used by the traveling public that will later use the new or reconstructed crossing.

For an existing crossing to be abandoned, the strip map shall clearly show the state highway route that the traveling public, now using the crossing, would be required to travel after the crossing is abandoned. The District Railroad Coordinator will work with the Railroad and PUC for any at-grade crossing closure. The Railroad will request approval from the U.S. Surface Transportation Board for any crossing closure.

### (3) *Exhibit B*

(a) New Crossings (at-grade crossing or separated grade crossing) - This exhibit shall contain the following:

- Plan - Generally at a plotting scale of 1"=20' or 1"=50'. For separated grade crossings, a copy of the Structure General Plan would be appropriate for use as the plan portion of the exhibit. Plan coverage for at-grade crossings should extend about 400' each side of the crossing on the railroad and 200' on the highway. For at-grade crossings, the proposed crossing protection devices are to be identified and shown.
- Profiles - A separate profile for the railroad and one for the highway. The railroad profile shall show the railroad stationing, datum elevation, existing top of rail grades and rates, proposed rail grades, proposed Points of Intersection (PI's) and Vertical Curves (VC's) and the centerline of the highway crossing with station and elevation.
- The highway profile shall show stationing, datum elevation, ground line, grade line with rates, Line Designation and route identified and any other necessary components as described in Section 2-2.5 of this PPM.



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Where each rail crosses the highway profile grade line, identify each rail with its elevation and the stationing of each rail or track centerline.

- Typical Cross Section - The structural section of the highway at the crossing. The typical section is to be normal to the highway. The statement that “Construction must follow PUC Standard No. 3, of PUC General Order 72-B, or equal” shall be added unless a different Standard is required by the Railroad.
  - Proposed Easements - The proposed easement is to be superimposed on the Structure General Plan portion of the exhibit for a separated grade crossing. For at-grade crossings, the proposed easement is to be shown on the plan view of this exhibit.
- (b) Existing Crossing to be Altered - The exhibit shall contain:
- Plan - Same instructions as new crossing. In addition, the location of the existing and the proposed protection, if required, shall be shown. Also, where additional lanes are to be constructed at the crossing site, it is necessary to clearly indicate whether the additional lanes are to be constructed throughout the highway project.
  - Profile - Same instructions as new crossing.
  - Typical Section - Same instructions as new crossing.
  - PUC Crossing Number- shall be shown on the plan.
  - Existing and Proposed Easements - Existing and proposed easements is to be superimposed on the Structure General Plan portion of the exhibit for a separated grade crossing.

For at grade crossings, the existing and proposed easement is to be shown on the plan view of the exhibit.

- (c) Existing Crossing to be Abandoned - An Exhibit B is not required.



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